

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
12 April 2001 (12.04.2001)

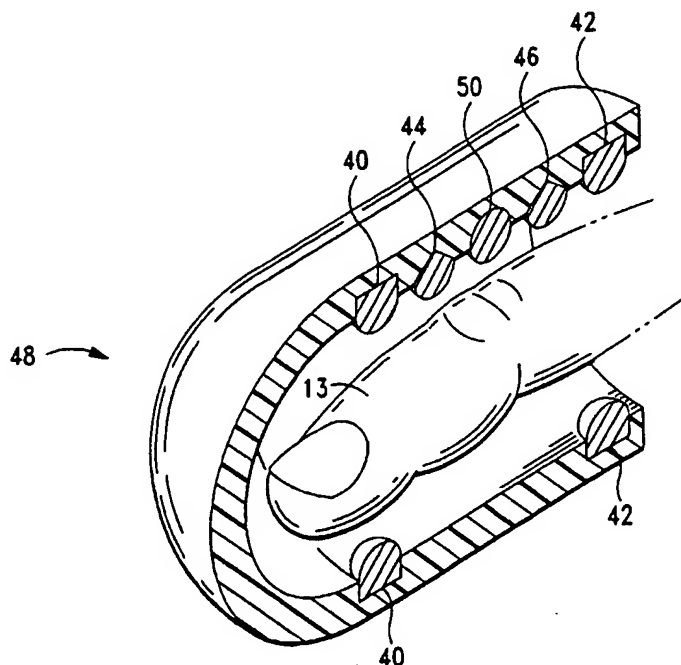
PCT

(10) International Publication Number  
**WO 01/24845 A3**

- (51) International Patent Classification<sup>7</sup>: **A61B 5/02**
- (21) International Application Number: PCT/US00/27654
- (22) International Filing Date: 6 October 2000 (06.10.2000)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
60/158,097 7 October 1999 (07.10.1999) US
- (71) Applicant and  
(72) Inventor: **MILLS, Alexander, K.** [CA/US]; 7 Old Westbury Lane, Webster Groves, MO 63119 (US).
- (74) Agent: **FRANCIS, Ralph, C.**; Francis Law Group, 1946 Embarcadero, Oakland, CA 94606 (US).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- Published:  
— With international search report.

[Continued on next page]

(54) Title: METHOD AND APPARATUS FOR NON-INVASIVE CONTINUOUS DETERMINATION OF PHYSIOLOGICAL PARAMETERS OF A PATIENT'S BLOOD



(57) Abstract: The invention comprises devices for noninvasively monitoring physiological characteristics of a patient's blood. Generally, probes (48) having radiation emitters and detectors (40,42) are used to determine absorbance of blood within the patient's tissue to determine various blood parameters. The device also has either a position sensor (50) for determining the .

[Continued on next page]

WO 01/24845 A3

Best Available Copy



— Before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(88) Date of publication of the international search report:

7 June 2001

Best Available Copy

position of the probe (48) with respect to the patient's heart or a movement generator for altering the position of the probe (48) with respect to the patient's heart. The invention also comprises methods for noninvasively monitoring the physiological characteristics. In one embodiment, induced positional changes create differential hydrostatic pressures to facilitate measurement of blood parameters by absorbance. In a second embodiment, delays in pulse arrival times in coupled organs or members on opposite sides of the body are measured to determine cardiac output. The two methods are such that they can advantageously be used together.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US00/27654

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(7) : A61B 5/02 US CL : 600/481, 407, 473, 476, 479 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) U.S. : 600/481, 407, 473-480, 483, 484, 500, 501, 502, 504, 507, 465, 454, 437 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EAST		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,778,879 A (OTA et al) 14 July 1998, col. 2, lines 23-50, and Figs. 1 and 7.	1, 8, 13, 20, and 25
Y	US 5,111,826 A (NASIFF) 12 May 1992, col. 5, line 50 to col. 6, line 20, col. 6, line 67 to col. 7, line 66, and Figs. 1, 2, and 10.	1, 8, 13, 20, and 25
X	JP 04064334 A (SENGOKU) 28 February 1992, Abstract and Figs. 1 and 2.	1-25
A	JP 03140138 A (CLAXTON, III et al) 14 June 1991, Abstract.	1, 8, 13, 20, and 25
A	US 4,998,534 A (Claxton, III et al) 12 March 1991, Abstract.	1, 8, 13, 20, and 25
X	JP 63311929 A (YAMAZAWA) 20 December 1988, Abstract and Figs. 1 and 2.	1-25
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: *A* document defining the general state of the art which is not considered to be of particular relevance *E* earlier document published on or after the international filing date *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) *O* document referring to an oral disclosure, use, exhibition or other means *P* document published prior to the international filing date but later than the priority date claimed *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art *&* document member of the same patent family		
Date of the actual completion of the international search 22 FEBRUARY 2001		Date of mailing of the international search report 30 MAR 2001
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230		Authorized officer NAVIN NATH THATHADHA Telephone No. (703) 305-2445

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US00/27654

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 63283625 A (TERADA et al) 21 November 1988, Abstract.	1, 8, 13, 20, and 25

Best Available Copy